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D4.3

Demonstrator 1, Test Report



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1. DOCUMENT INFORMATION

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2. DOCUMENT HISTORY

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4. INTRODUCTION

This deliverable describes the tests done with the pilot demonstrator of the Peephole use case in order to evaluate its performance and ability to fulfill the requirements.

The Peephole demonstrator is composed of two parts:

- The EoT device in a peephole configuration
- An Android smartphone running the IFOYD app

An EoT device simulator has also been developed running on a PC in order to develop the IFOYD Android app in parallel with the development of the EoT platform and its software. This simulator has been presented and described in deliverable D4.2 and will not be discussed in this document.

The Peephole use case was specified during the first phase of the project and the 26 requirements that were issued at that time will be verified in this document.

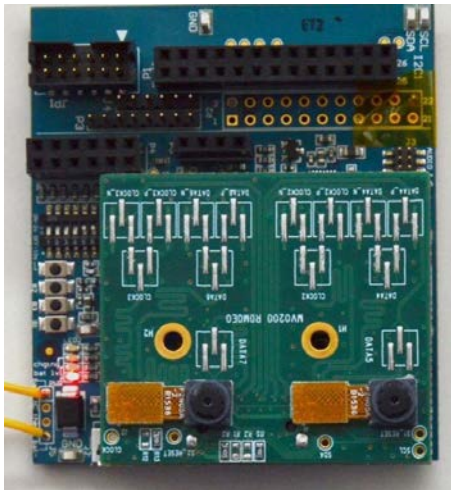
The use cases were targeting functionalities of increasing complexity, as the aim was mainly to qualify the performance of the device. Most of the targets have been achieved, but some more challenging such as facial recognition could not be implemented and tested. This does not mean that the device will not be capable of achieving facial recognition, but due to the complexity of the Myriad 2 component, we did not have enough time to develop this optional feature.

5. DEMONSTRATOR TESTS

6.1 Equipment

The Peephole demonstrator that has been tested is composed of 2 parts:

a) The EoT device



The Peephole device equipped with a AMX 208 module (Sony).

The EoT Peephole device software was mainly developed by DFKI. They did numerous tests on their device to fine tune the settings. The results of these tests are not part of this document.

For the report, the tests done with the Peephole demonstrators owned by Thales in Velizy and UCLM in Castilla La Mancha running the same software have been recorded and exploited for this deliverable.

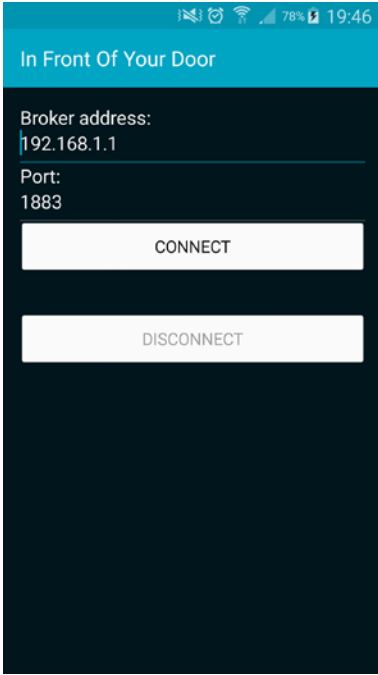
b) The IFOYD application software running on an Android smartphone

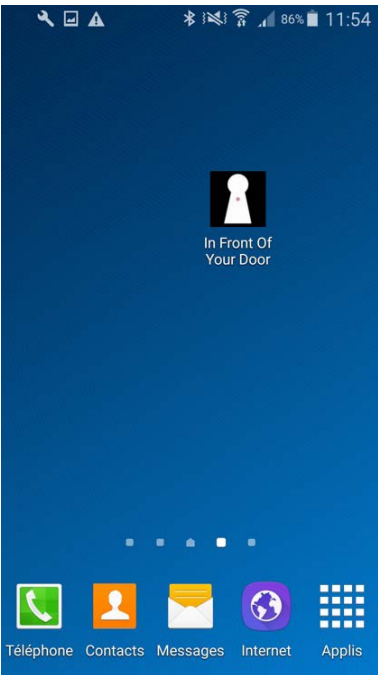


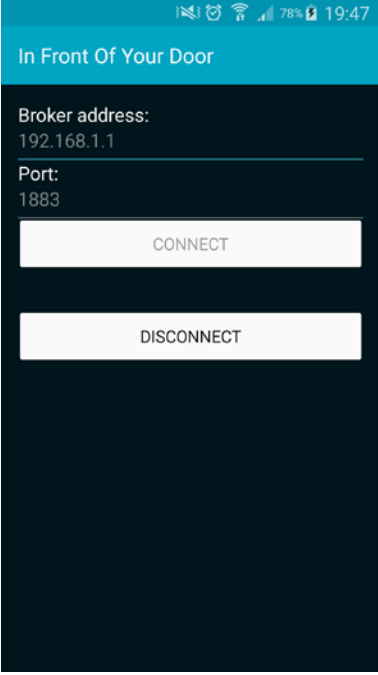
The IFOYD app was installed on different smartphones without problem.


The smartphone is first connected to the device's Wifi access point and then runs the IFOYD app.


6.2 Requirements achievement


ID	Name	Requirement	Result
REQ001	Connect to WiFi hot spot	Connection of the IFOYD app to the Peephole device Wifi access point	<p>OK</p> <p>Once the EoT device is powered, it sets-up a Wifi access point that can be accessed at 192.168.1.1. The access to this Wifi hotspot is protected by a WPA password.</p> <p>The connection is done in DHCP mode as the EoT device is attributing the IP address of the smartphone.</p> <p>For security reasons, the device only accepts one connection at a time.</p>
REQ002	Connect to the PC or Smartphone app	Connection to the app	<p>OK</p> <p>Once the smartphone connected to the Peephole' Wifi, the user has to select the address of the</p>  <p>Peephole device and the port (1883 by default).</p> <p>When the connect button is pushed, it gets out of focus and just the Disconnect button can be selected.</p>

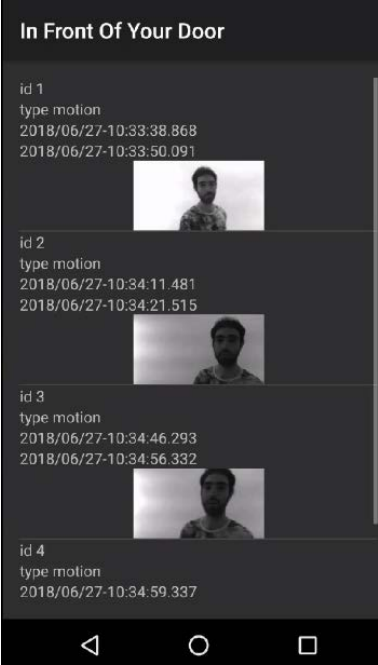
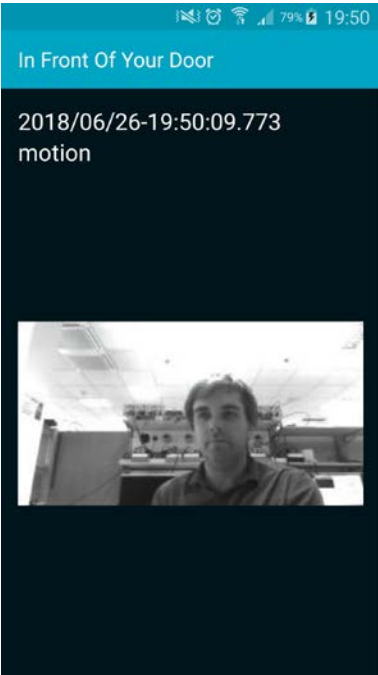
<p>REQ003</p>	<p>Module set-up</p>	<p>Set cloud address, login, password, application</p>	<p>Not implemented. Broker embedded in the device.</p> <p>During the specification phase, the only option was to connect the EoT device to a (cloud) server that would act as the broker. During the development of the EoT project, it appeared that the MQTT broker could be embedded in the device, which would reduce the security risks. It was decided to go to this option.</p>
<p>REQ004</p>	<p>Start operation</p>	<p>Start the app on the module</p>	<p>OK</p> <p>When the IFOYD icon is pushed, the app starts</p> 

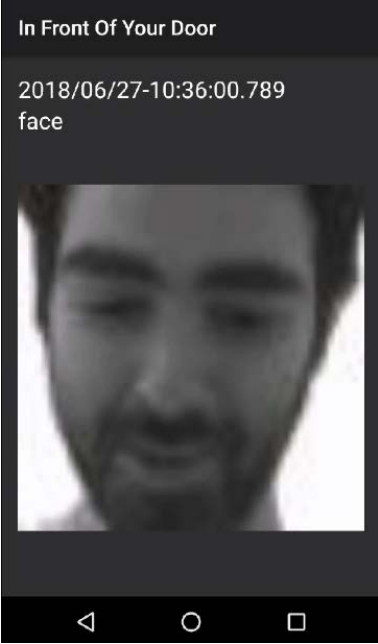
REQ005	Stop operation	Stop the app on the module	<p>OK</p> <p>To stop the device, the user has to go on the main page of the app and push the "DISCONNECT" button.</p>  <p>The screenshot shows a mobile application interface with a dark blue background. At the top, there is a status bar with icons for signal, Wi-Fi, and battery (78%), and the time 19:47. Below the status bar is a light blue header with the text 'In Front Of Your Door'. The main content area is dark blue and contains the following text: 'Broker address: 192.168.1.1' followed by a horizontal line, and 'Port: 1883'. Below this text are two white buttons: 'CONNECT' and 'DISCONNECT'.</p>
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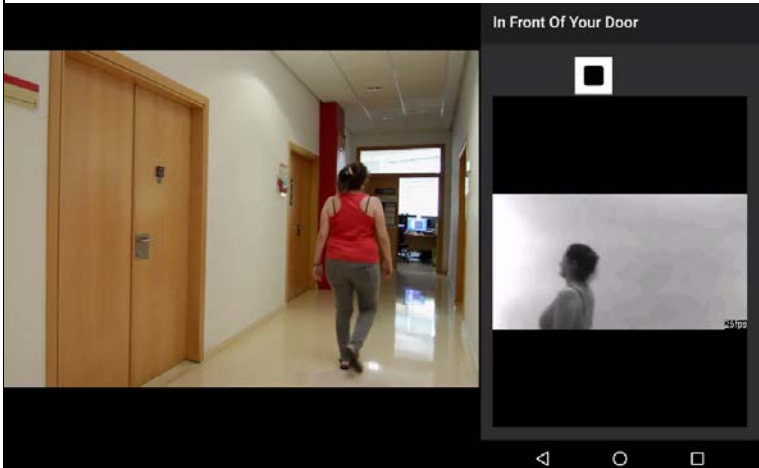
<p>REQ006</p>	<p>Status</p>	<p>Send the module status:</p> <ul style="list-style-type: none"> • Active /Standby • Event detected or not • Last events • Memory used/remaining • Battery level • I/O status • Camera status (average light level) 	<p>Partially achieved</p>  <p>Currently only operational features are implemented.</p> <p>Data such as Memory used, Battery level I/O status or Light level have not been implemented</p>
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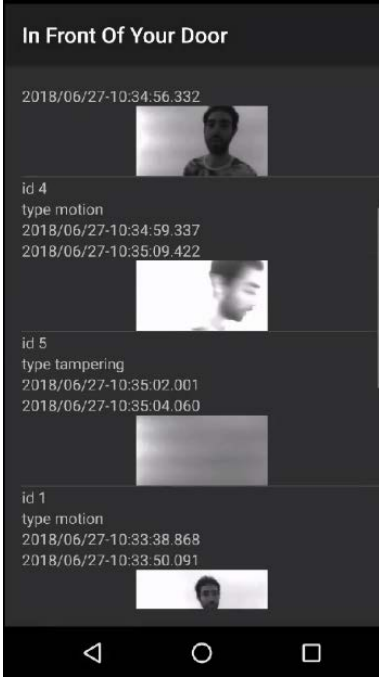
REQ007	Take photographs	Take a picture with the camera and send it over wifi	OK 
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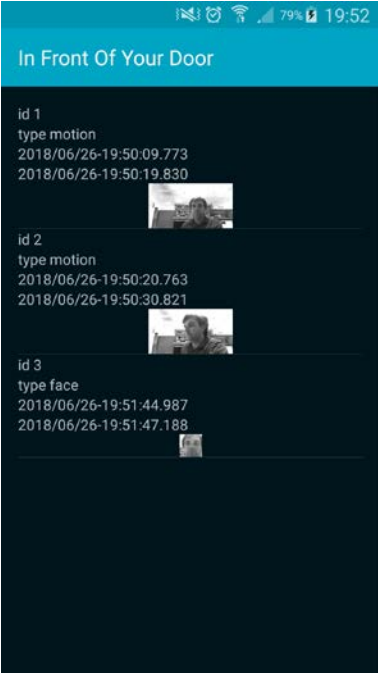
<p>REQ008</p>	<p>Loop recording at 1 fps</p>	<p>Record 60 frames at 1 fps in a circular buffer</p>	<p>Partially achieved</p>  <p>The sequence is not recorded continuously, but once the alarm has been triggered. However, the implementation of the circular buffer was achieved.</p>
<p>REQ009</p>	<p>Circular buffer freezing</p>	<p>Freeze the circular buffer</p>	<p>Circular buffer not implemented</p>

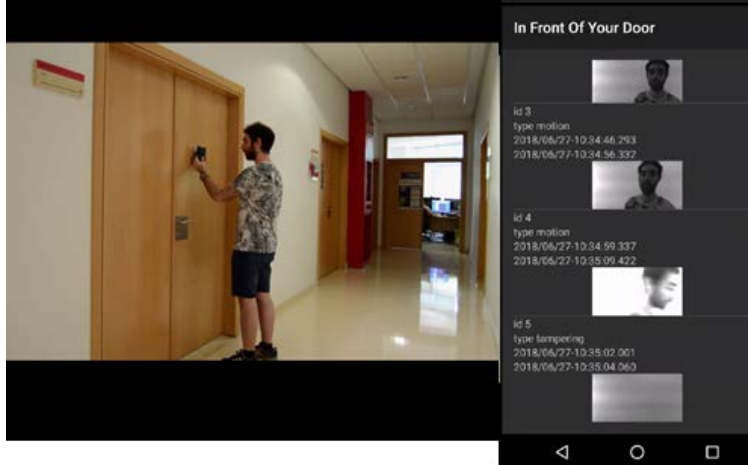
<p>REQ010</p>	<p>Recording @ 25 fps or 12 fps</p>	<p>Record during the alarm duration</p>	<p>OK</p> <p>Sequences are stored and can be replayed</p> 
<p>REQ011</p>	<p>Send an alarm to the app</p>	<p>Send the alarm flag and alarm type to the server</p>	<p>OK</p>  <p>The alarm and the type of alarm are sent to the app with the snapshot.</p>

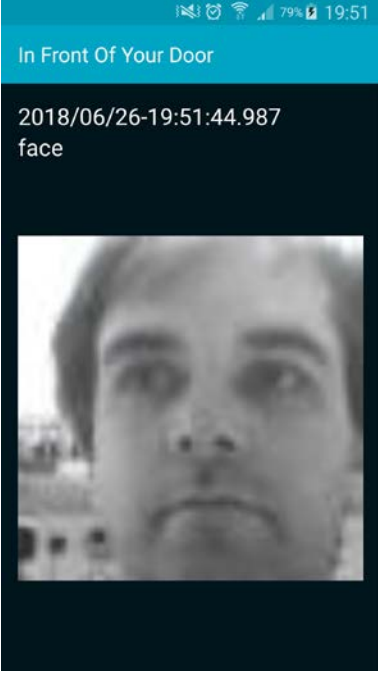
<p>REQ012</p>	<p>Send the picture of the alarm</p>	<p>Send the picture corresponding to the triggering of the alarm to the server</p>	<p>OK</p>  <p>Snapshot is sent with the alarm (face detection in this case)</p>
<p>REQ013</p>	<p>Send the pre-alarm buffer</p>	<p>Send the circular buffer to the cloud server</p>	<p>Not implemented</p>

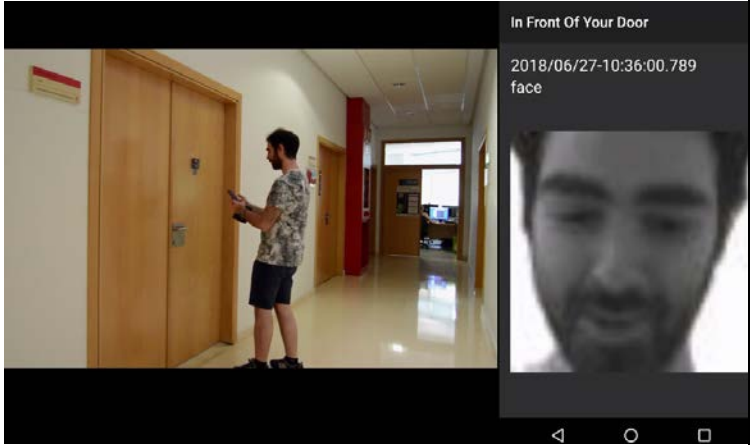
<p>REQ014</p>	<p>Send the post alarm buffer</p>	<p>Send the post alarm buffer to the server</p>	<p>OK</p>  <p>The post alarm buffer is transferred when the play button is pressed. Playback can be paused using the "pause" control (visible on the picture).</p>
<p>REQ015</p>	<p>Send the live video</p>	<p>Send the live video to the app</p>	<p>OK</p>  <p>The left part (in colour) of the image shows the environment and the person passing in front of the door equipped with the peephole device.</p> <p>The right part shows the live video and the frame rate (25fps)</p>

<p>REQ016</p>	<p>Return to standby mode</p>	<ul style="list-style-type: none"> • Transfer all buffers to the server • Clear buffers • Resume circular buffer recording 	<p>OK (except for circular buffer not implemented)</p>  <p>The screenshot shows a mobile application interface with the title "In Front Of Your Door". It displays a list of events with the following details:</p> <ul style="list-style-type: none"> Event 1: id 4, type motion, timestamp 2018/06/27-10:34:56.332, with a video thumbnail showing a person's face. Event 2: id 5, type tampering, timestamp 2018/06/27-10:35:02.001, with a video thumbnail showing a blurred scene. Event 3: id 1, type motion, timestamp 2018/06/27-10:33:38.868, with a video thumbnail showing a person's face. <p>The interface also shows a timestamp 2018/06/27-10:35:09.422 and another timestamp 2018/06/27-10:33:50.091. The bottom of the screen shows standard Android navigation icons.</p>
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<p style="text-align: center;">REQ017</p>	<p>Presence detection</p>	<p>Detect one or several objects moving in front of the camera.</p> <p>Size of the objects to be determined (1 person at 5 meters)</p>	<p>OK</p>  <p>Detection is achieved when some object is moving in front of the peephole device.</p> <p>A setting related to the size of the object should be provided in order to improve the detection.</p>
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<p>REQ018</p>	<p>Tampering detection</p>	<ul style="list-style-type: none"> • Detection of a dark picture for more than 5 sec • Detection of a partially occulted picture for more than 5 sec • Detection of a highly blurred picture for more than 5 sec 	<p>Partially implemented</p>  <p>Occlusion is detected. On the left part (in colour) the person is occluding the peephole. The alarm events show motion detection followed by the tampering detection. Blurred picture detection has not been implemented.</p>
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<p>REQ019</p>	<p>Face detection</p>	<ul style="list-style-type: none"> • Detect the presence of a face with a width ranging between x and y pixels (tbd) • Detect a face oriented between + and - X degrees horizontally (tbd) • Detect a face oriented between + and - X degrees vertically (tbd) 	<p>OK</p>  <p>Face detection provides a cropped image of the face.</p>
<p>REQ020</p>	<p>Face contrast</p>	<p>Detect a face with a minimum contrast of (10%) of the full scale level (tbd)</p>	<p>To be improved.</p> <p>The settings on the camera image quality and face detection parameters cannot be accessed currently from the IFOYD app. This will be implemented in the future, .</p>
<p>REQ021</p>	<p>Scene Illumination</p>	<p>Operation with a minimum illumination of 1 lux on the scene</p>	<p>Not tested</p> <p>The camera used for the demonstrator was a B/W Sony IMX 208 module instead of a colour module that was not available.</p> <p>A full setting of the image parameters should be implemented with the final sensor.</p>

REQ022	Face thumbnail extract and send	Extract a thumbnail image of the face detected in the picture to the cloud server	<p>OK</p>  <p>The colour image shows the person in front of the peephole device. On the right, the face is cropped and sent to the IFOYD app.</p>
REQ023	Upload face patterns to the module	Upload a list of known face patterns	Not implemented
REQ024	Send positive face recognition event	In case a facial match has been detected, send the event, face thumbnail and ID to the cloud server	Not implemented
REQ025	Start bi-directional audio	Start audio communication with the module	<p>Demonstrated but not implemented</p> <p>Audio transmission was demonstrated at the Vienna Consortium meeting in December 2017. It has not been implemented on the peephole demonstration due to lack of time.</p>
REQ026	Stop bi-directional audio	Stop audio communication with the module	Not implemented

6. CONCLUSIONS

Not all the functionalities specified at the beginning of the project could be implemented. However, the results achieved at the end of the project are promising. The EoT device as specified constitutes a good platform for a smart vision IoT device for security applications, which is our main interest.

During the development of the demonstrator, several difficulties have been identified, mainly concerning the use of the Myriad-2 chip, which requires skilled engineers to develop software associated to the processor, sensors, communications, optimized vision and deep learning inference. An additional challenge concerns the development of a full power management library in order to reduce the consumption to the lowest achievable. All of this means that the know-how acquired within the Consortium is somehow unique and can be exploited because of its inherent high value.

- End of document -